VOL. VIII, NO 2, APRIL, 1961

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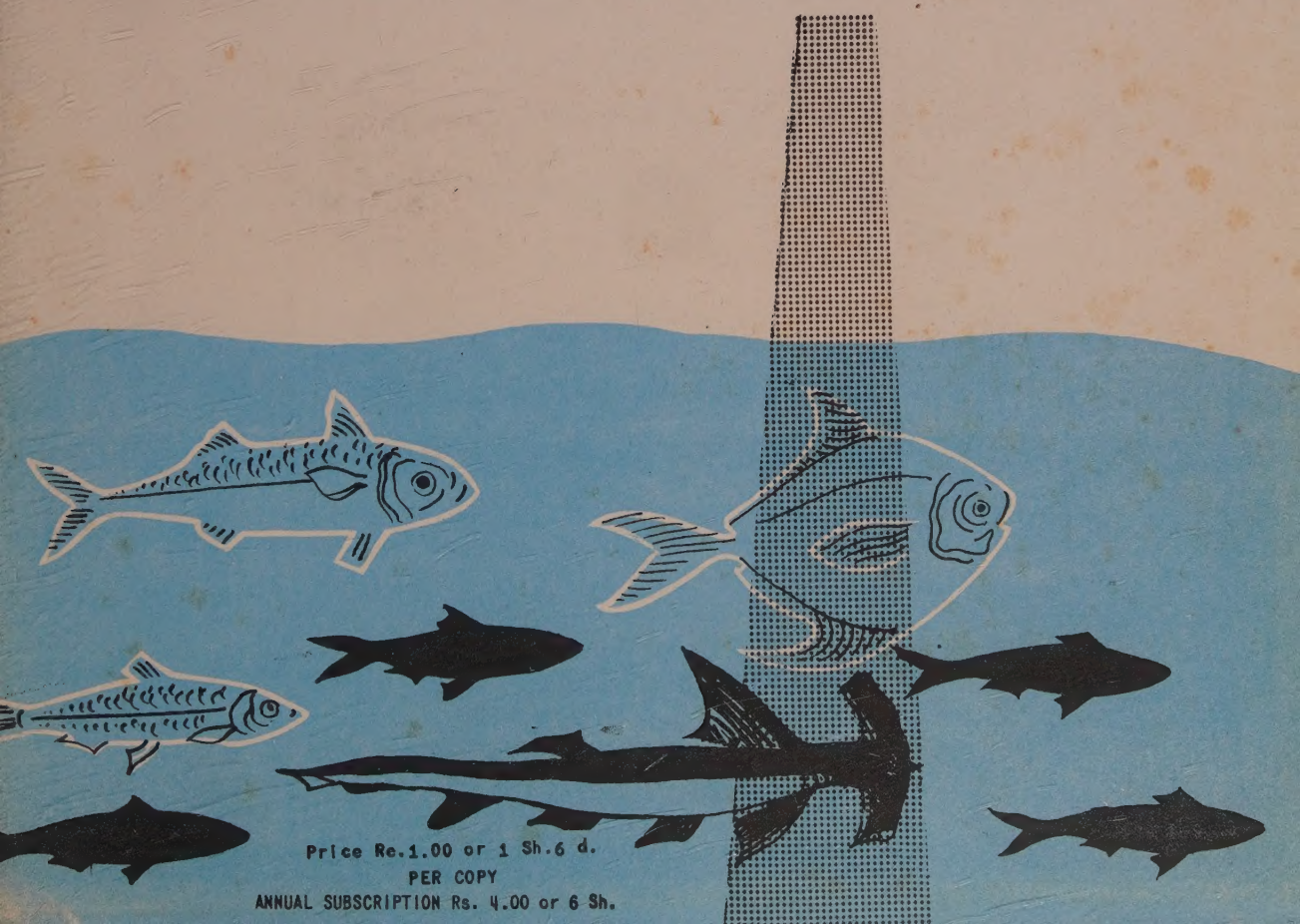

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Issued by
GOVERNMENT OF INDIA

MINISTRY OF FOOD & AGRICULTURE
[DEPARTMENT OF AGRICULTURE]

Price Re. 1/- or 1 sh. 6d.

The 9th Session of the Indo-Pacific Fisheries Council was held at Karachi in January, 1961. The session was inaugurated by the Minister for Food & Agriculture, Lt. General Khalid Mohmood Shaikh, Pakistan Government at the National Assembly Hall, Karachi, on the 10th January, 1961. The officially accredited representatives of the Member Governments participating at the session were those of Australia, Ceylon, France, India, Indonesia, Japan, Korea, Federation of Malaya, Netherlands, Pakistan, Philippines, Thailand, United Kingdom, United States of America and Vietnam.

The 9th Session Symposium on "How to formulate programmes of fisheries research and technological improvements, particularly in fish handling required for the implementation of national policies for fisheries development and methods of assessing progress in these programmes" was held on 16th, 17th and 18th January. Abstracts of Symposium papers and technical papers presented before the 9th Session of the Indo-Pacific Fisheries Council in January, 1961, are included in this issue of the Indian Fisheries Bulletin.

SYMPOSIUM ON "HOW TO FORMULATE PROGRAMMES OF FISHERIES RESEARCH AND TECHNOLOGICAL IMPROVEMENTS, PARTICULARLY IN FISH HANDLING REQUIRED FOR THE IMPLEMENTATION OF NATIONAL POLICIES FOR FISHERIES DEVELOPMENT AND METHODS OF ASSESSING PROGRESS IN THESE PROGRAMMES".

Sym. 2.—The Formulation of a Fisheries Development Programme

Main objectives in marine fisheries development and the problems encountered in the formulation and implementation of development programme are discussed. The problems which might be encountered in formulation and implementation of development programmes fall roughly into two categories *viz.* Technological problems and Socio-economic and marketing problems.

Technological problems arise mainly from (i) the nature and the fish stocks available for exploitation and their distribution in space and time, (ii) the environmental factors such as the nature of the sea bottom as well as the meteorology, the currents and the hydrology of the fishing grounds, (iii) the productivity of the area, (iv) the nature and efficiency of the existing fishing gears and boats in relation to the area of exploitation and the resources exploited and (v) the modification of the existing fisheries technological practices. Socio-economic and marketing problems are concerned mainly with (i) the fishermen and their socio-economic and psychological background, (ii) the existing pattern of capitalisation of the industry, (iii) the existing organisation for the distribution and marketing of fish and fishery products, (iv) the factors which affect the price of fish and fishery products and (v) the consumers and their preferences. The above problems and the inter-relationships between these problems are described. Procedure in the formulation of a fisheries development programme is suggested.

(Tham Ah Kow, Director of Primary Production. Ministry of National Development, Singapore.)

Sym. 3.—The Role of the Technological Laboratory in the Rapid Development of the Fish Processing Industry in India.

An All India Fisheries Technological Research Station has been set up at Cochin with effect from December, 1958. The role of this laboratory in the rapid development of the fish processing industry has been discussed.

The important prawn fisheries, which are a valuable foreign exchange earner, present many problems. The quality of the processed prawn products has to be improved, so that the product may compare with the best products manufactured elsewhere. The problems pertaining to the fresh and frozen fish and the need for suitable processing centres at important fresh fish distribution centres is discussed.

The salt and dry fish industry, the major fish processing industry in India needs rapid development, to supply higher quality products. Salting and drying will continue to be the only practical way of supplying cheap fish in the rural areas, and it will continue to play a vital role in the fish processing industry. Sun-drying, is the only large scale method of drying fishery products at present. The introduction of artificial driers is under investigation. The

limited scope for the rapid development of the fish by-products industry and the manufacture of quality meal out of pressed oil sardine cake are also discussed.

Finally the role of extension work, for the rapid propagation of laboratory findings is reviewed.

[R. Venkataraman and S. A. Beatty—Central Fisheries Technological Research Station, Ernakulam and FAO Expert (Fish Processing) with the Govt. of India].

Sym. 4.—Methods of Assessing Progress in National Fisheries Development Programmes.

Pointing out that it is frequently necessary to commence implementation of a development programme without adequate knowledge of the resource or of personnel or funds to proceed with all phases simultaneously, the paper quotes an example of a promising development project which produced disappointing results due apparently to lack of proper timing of the various phases, inadequate attention to past experiences and possibly incomplete information on cost-return potential.

Experience has shown that the basic essentials of a fisheries development programme have a very broad coverage and that local conditions seriously influence the problems of co-ordinating the several phases, planning, research and economic aspects.

Assessment of progress requires a periodical review of all available data, technological, biological and socio-economic.

Comparisons are drawn regarding the basic objectives of such a programme, which may differ materially according to the social and economic development of the country or area concerned.

(The Department of Fisheries—Canada).

Sym. 5.—The Establishment of a National Programme of Fisheries Research.

On the basis that fisheries are common property, the paper postulates the need for Government management based on a national policy. The type of administrative structure, which varies widely from country to country, will depend largely on local choice and Governmental organization.

It is vital that the head of the fisheries organization should be able and energetic and he must have ample authority. The effectiveness of the organization will depend upon the quality of the personnel engaged.

A development programme must be based on facts carefully gathered and interpreted, the area from which the facts are to be gathered will be determined by local conditions and requirements in the first instance and a research team and its equipment should be built up accordingly, but only after a preliminary survey of the actual requirements has been made.

An assessment of the effectiveness of a research programme should be based on the rate of accumulation and accuracy of essential data necessary to provide the administration with the information leading to the effective management of the resource.

(C. P. Idyll, Chairman, Division of Fisheries, The Laboratory, University of Miami).

Sym. 6.—The Organization of Fisheries Scientific Research.

The problems fisheries research scientist in the survey of fish stocks, water masses affecting fishing grounds and plankton are discussed. For the fisheries research Scientist the Problem is to conduct a survey of the Offshore waters, to precede and accompany future commercial exploitation. The above programme will in the course of years lead to an understanding of the relationship between water movements as defined by the hydrological survey and the distribution of the plankton both in time and space. This will have a direct bearing on the distribution and perhaps the seasonal appearance of plankton feeding pelagic fishes, such as sardines, herrings and anchovies and an indirect bearing on the ground fishes which feed either on the shoaling fishes or on the benthos which makes up a large proportion of the temporary plankton in its youth.

The organisation and equipment required to carry out such a program is dealt with in detail. The equipment of a research vessel, the shore base and personnel required are discussed.

(F. D. Ommanney, Fisheries Research Unit, University of Hong Kong, Hong Kong).

Sym. 7.—Analysis of the Organization and Research Programme of an Inland Fisheries Administration.

The essential steps in setting up the programme for an inland fisheries administration are a preliminary survey of the situation, then more precise research concerning aspects of primary importance thence laboratory and pilot experiments to determine the most effective means of utilization of resources and finally the dissemination through education and extension services of the results of such research and experiments.

No detailed plan can be devised suitable for all countries, local conditions will determine lines of research and order of priority in experimentation.

(J. J. Schuurman, Agricultural University, Wageningen, Netherlands).

Sym. 8.—Fishery Problems in the French Territories of the Pacific—General and Specific.

The paper describes briefly the status of the fisheries of the French Pacific territories, which comprise three groups of islands located south of the Equator.

It is stated that the only fishery which may be developed to a high commercial level is that for pelagic species (Tunas) outside the reefs and lagoons. Exploratory fishery is continuing together with basic hydrographic studies in some areas.

The indigenous fisheries are largely based on reef and lagoon species which are sold fresh in the village markets. The use of ice and refrigeration is developing slowly as also in the export trade in tunas. Trochus, burgau and pearl shell fisheries are discussed and it is concluded that, where there is no local fishery, the oceanic areas should be studied to demonstrate the occurrence of exploitable stocks of fish and, where local fisheries exist, methods improving and developing them are of first priority.

(M. Angot, Oceanographe Biologiste, Office de la Recherche Scientifique et Technique Outre-Mer, Institut Francais d'Oceanic—Noumea.)

Sym. 9.—Federal Commercial Fishery Administration in the United States.

The paper describes the origin, structure and function of the Bureau of Commercial Fisheries and the coordination of the work of the Bureau with other Government agencies directly or indirectly concerned with one or more aspects of the fishery industry. It emphasises that the basis of good fishery administration is a sound national policy geared to the potential of the fishery resources and to the national interest.

The paper also states that an appropriate place in the overall governmental organisation is as necessary to effective fishery administration as is a forthright fishery policy.

In U.S.A., the national government prefers to leave to private initiative all those functions which private enterprise can perform or next, to use the governmental level most concerned with the problem.

The commercial fishery industry and educational institutions are expected to make their appropriate contributions to the overall task.

The International organisations and U.N. Specialised Agencies such as F.A.O. have contributed materially to the increasing knowledge and understanding of fishery problems. International Fisheries Commissions have offered effective means to ensure cooperation between governments in the conservation of jointly exploited resources.

The need for the careful assessment of problems and the establishment of appropriate priorities in programming is stressed.

(A. J. Suomela, Commissioner, U.S. Fish and Wildlife Service, Department of the Interior, Washington 25, D.C.)

Sym. 10.—Federal Assistance in the Marketing of Fishery products in the United States.

The paper outlines U.S. federal policy in fish marketing, which is in conformity with the general policy of the development of private initiative and enterprise. Assistance is rendered at federal level only when the private agencies and local and State Governments are unable to deal effectively with

a problem. Private marketing enterprises and local, State and Federal Government agencies frequently combine to attack a particular problem, each undertaking the responsibility it can handle best.

Data on domestic catch and its disposition, exports and imports are given as well as estimates of consumption and an analysis of future consumption trends.

The structure of the Marketing Branch of the Bureau of Commercial Fisheries and its programmes and the methods of implementation of these are described.

(A. W. Anderson, Assistant Director, Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, Washington, D.C., U.S.A.)

Sym. 11.—Development and Control in the Fisheries.

Specific purpose of the paper is to bring out the proper relationship between action of a positive or a negative nature falling under management or mis-management. Legislation on the basis of insufficient information, is often one of the worst forms of mis-management. No restrain of the fisheries is justified unless it be on a sound scientific basis and it should be axiomatic that the calculated results should always be favourable to the industry or to the economy as a whole, the two things as a rule being inseparable.

The basis on which the two powerful and interacting weapons, development and restrain should be brought to bear and the criteria involved are discussed. Two of the principal aspects—biological considerations and economic factors and the two main groups, biologist and economists are examined. The general approach to the problem and the number of expedients available in the efforts to achieve the admittedly theoretical goal, some of which are in the economic sphere and some in the biological are outlined.

To rationalise the management of fisheries the first step is to recapitulate and build on what has already been done. The training and retention of competent specialists in biology, technology and economics, the acquisition and proper utilisation of the literature, and the rational coordination of these different skills at the administrative level, appear to be the most obvious hindrances to progress in this field.

(C. miles, Regional Fisheries Officer at F.A.O. Regional Office, 1008 Rua Jardin Botanico, Rio de Janeiro, Brazil.)

Sym. 12.—Programmes of Fisheries Development.

In all cases where the fisheries of a country are developed intentially it is good economy to use clear cut criteria and well tried procedures in this process. The priorities to be set in the procedure of development covering five main fields of fisheries are discussed.

The nature and possible patterns of the operational activities necessary to set development of a chosen fishing industry, expansion of landings and its relation to marketing possibilities and the economics of the industry are analysed and a few examples to illustrate the points of view are given.

(C. J. Bottemanne, Fisheries Adviser to the Netherlands Ministry for Overseas territories, Westeinde, 134, Voorburg, Netherlands).

Sym. 14.—Planning and Implementation of Research Programme in Fish Handling and Processing in Less Developed countries and Assessment of Progress of such Programmes.

There is a general lack of a clearly defined policy towards research in fish handling and processing in the less developed countries. Although the amount of work done is significant, the type of technical data required for planning development of the industry is often not available. A comprehensive review of the existing knowledge should be made in order that the gaps in knowledge may be identified and defined. Research should be undertaken only where gaps exist, particularly where such gaps retard the introduction of development projects. Solutions found and applied elsewhere, particularly in countries with similar social, economic and climatic conditions, should be adapted to local conditions.

The organisation to administer research should have adequate administrative and financial authority to be able to take prompt action. Where circumstances permit, the organisation should be an autonomous one. Fish processing research may be associated with fisheries biological research in a single organisation, or associated with food research in general, administered under a single body. Both the systems have been equally successful. Available facilities for conducting research make it necessary that priorities be assigned to the various problem of the industry. In evolving solutions to the various problems and in developing new products, due consideration should be given to economic conditions and preferences of the consumer. To make good use of the available facilities, efforts should be made to coordinate research at national as well as international levels. Adequate extension services should be created to assist in the application of research results to the industry. Target dates should be assigned to the various research projects and their progress periodically checked. Adequate modifications in the plans should be made if found necessary as a result of such checks. The scope of research is limited to identification of the defects of the industry and to finding proper solutions. Application of research results lies beyond the scope of research workers.

(M. R. Khan, Fisheries Technologist, Fisheries Division, F.A.O. of the United Nations, Rome).

Sym. 15.—Observations on the Development of Fisheries in Orissa.

In an under-developed country with good fisheries potential, establishment of small units, based on sound technical knowledge is considered to be a more suitable pattern for development rather than taking up large-scale survey and having a department dealing with administration, research and development all together from the beginning.

The slow evolution of the department in the above manner creates local technicians and makes propagation of the knowledge comparatively easy. Extension workers should not confine themselves to advice only but take up individual projects themselves and show greater yields by working with the

farmers. They should therefore be first rate technicians. Fisheries legislation and demonstration should be taken up only after a certain degree of organisational and technical efficiency has been achieved.

(G. N. Mitra, Director of Fisheries, Orissa, India).

Sym. 16.—Methods of Assessing Progress in Fisheries Development Programmes.

It is well known that active attention is being paid in recent years in regard to fisheries development both in marine and inland sectors in various countries which are members of the Indo-Pacific Fisheries Council. Considerable financial assistance is given by the respective governments, F.A.O. of United Nations Organisation, TCM of USA and other organisations for fisheries development in various countries. Those measures have resulted in gradual development of fisheries from year to year.

One of the difficulties facing the Departments of Fisheries in various countries is the lack of a suitable method of correctly assessing and evaluating the progress made in fisheries development. The assessment of fish production in the sea from year to year, which mainly depend on improved craft, gear and efforts, is comparatively easy. The fish catch statistics can be obtained directly from the fishing craft or from the assembly centres. Similarly fish catch statistics relating to fish production in inland capture fisheries, such as those of rivers and estuaries can be obtained by establishing required number of fishery survey centres at suitable places. The greatest difficulty is experienced in regard to assessment of fish production in culture fisheries. Devising a suitable sampling method to get production figures from culture fisheries which are of varied dimensions, in different stages of utilisation and highly dispersed over a vast area, has proved to be extremely difficult. In India, collection of catch statistics from marine fisheries is well-organised and steps have been taken to organise collection of catch statistics from riverine and estuarine fisheries. Devising suitable method for assessing progress in fisheries development is engaging the attention of the Fisheries Research Committee.

In the absence of a suitable method of assessing progress in fishery development from year to year, factors like the amount of loan issued for various development schemes such as reclamation of derelict fisheries, supply of fish spawn and fry for culture purpose, supply of yarn for net making, supply of salt for fish curing, are taken as a measure to estimate the higher production of fish. Such estimates are often erroneous as the aid given is not often used for the purpose for which they were intended.

The only correct method to assess progress in fisheries development will be by estimating actual progress by an accurate method. For this purpose it is very necessary for every State and/or country to set up a suitable statistical unit or organisation to collect required data on progressive fish production.

(B. S. Bhimachar, Central Inland Fisheries Research Station, Barrackpore, India.

Sym. 17.—Some Aspects of Fisheries Administration.

In countries which are deficient in protein, all possible lines of development to increase fish intake of the people should be fostered and it is useful to

develop an area-wise approach in the problem of developing and utilising fishery resources. While efficient administrative machinery have been organised in a district or zonal manner for agriculture, forestry and other subjects, fisheries administration machinery in India has not followed parallel lines. A scheme is described in which India is to be divided into 200 fishery districts, each district being in charge of a District Fishery Officer. The duties and responsibilities of the District Fishery Officer are described. The training of the administrative personnel is also dealt with.

(N. K. Panikkar, Fisheries Development Adviser to the Government of India, Ministry of Food and Agriculture, New Delhi.)

Sym. 18.—The Principal Fisheries Development Projects of the Philippines.

The development and utilization of inland water resources in the Philippines are described. The Bureau of Fisheries has given priority to "bangos", "ipon" and "Siganid" fry industry. Marine fisheries research projects include study of biology of major commercial species of fish in Manila and San Miguel Bay. Oceanographic studies are being conducted by research vessels particularly the "Malasugui" which was acquired in January (1959). Other research projects in improvements in deep sea fishing and fish processing are described.

(D. V. Villadolid and J. Marques—Biological Research Centre, National Institute of Science and Technology, National Science Development Board, Manila, Philippines.)

Sym. 19.—Development of Japanese Fisheries.

The development of Japanese fisheries as seen from statistics improvement and evolution of production means, changes in exploitation of resources, fishery research and education, construction of fishing harbours, cooperative activities in fisheries, and objectives to be achieved in the future are discussed.

(N. Oka, Chief, Data and Statistics Section, Fisheries Agency, Kasumigaseki, Chiyoda-ku, Tokyo, Japan.)

Sym. 20.—A note on Fisheries Administration in Indonesia.

The functions of fisheries administration in Indonesia are described. There are two fisheries agencies in Indonesia—The Inland Fisheries Service and the Marine Fisheries Service and the activities of the two services are coordinated by a Fisheries Directorate. The Indonesian fisheries administration set up is illustrated.

(M. Alhjar, Chief, Provincial Inland Fisheries Service of West Java, Bandung.)

Sym. 21.—Fisheries Statistics in Australia.

This paper is a condensation of a report prepared by the Commonwealth Department of Primary Industry in collaboration with the Commonwealth

Scientific and Industrial Research Organisation for a conference of Commonwealth and State Fisheries Officers held during September, 1960. Although reference is made to the specific problems of statistical collections in Australia it is considered that its contents may prove to be useful background paper for discussions on the subject at the symposium.

(Commonwealth Department of Primary Industry and CSIRO.)

Sym. 22.—Some Problems of Fisheries Research with special reference to the Rastrelliger Fishery.

In some cases sea fisheries research cannot be carried out by the Sea Fisheries Service alone, but there is also an urgent need of cooperation with other Institutes which have to do with the investigations of the sea. In this case cooperation must be assured between the Sea Fisheries Service and the Institute of Marine Researches.

In carrying out oceanographical investigations, the Institute of Marine Researches has to face its own problems, but as far as routine work is concerned the determination of surface salinities for instance, is still in progress as a continual work of former years. For the purpose of Fisheries research in the near future, we have to take into consideration in particular the current system and salinities of the fishing areas, which are still of great help to the Fisheries workers in conducting their investigations.

To obtain more liable statistical data, we have to formulate a proper method for this purpose, considering the fact that we have so many landing places which are scattered and far from reach. Besides, the training of personnel to be stationed at local places and providing them with the equipments and transport facilities needed, is very important.

Biological and technological workers have in general more or less similar problems. Biological research as the investigation of the Rastrelliger Fishery encounters a slowing down, caused by lack of equipments and the absence of research vessels. This is also the case with the research of fishing technique and gear technology.

Taken as a whole it could be said, that the primary problems we have to face are those arising from the lack of equipment and facilities for the execution of work, not problems arising from the kind of research itself.

(V. Soesanto, Chief, Biological Division, Sea Fisheries Research, Sea Fisheries Service, Djakarta, Indonesia.)

Sym. 24.—Organisation of a Fisheries Agency (Australia).

The major aspects of the organisation of a Fisheries Agency such as staff, finance, functions of the agency and its position in the governmental structure are discussed.

The following is suggested as the optimum organisation of a hypothetical Fisheries Agency.

(1) The agency should be a branch of the Ministry of Food Production, with a direct line of contact from the head of the agency to the Minister. As a matter of courtesy, this could be modified to proceed *via* the head of the Ministry.

(2) The financing of the normal activities of the agency should be by funds derived from taxation revenue. Financing of development projects of a tangible nature—such as harbours, storage facilities etc.—should be by way of loan, the funds being derived from a loan fund which could be set up also by a grant from revenue. The U.S.A., with its Saltonstall—Kennedy Act, and the U.K., with its White Fish Authority loans, are good examples of the revolving fund for fisheries development.

(3) The staff should be recruited at the highest possible level. The head of the agency and his immediate subordinates act as a policy—framing body who are later responsible for implementing adopted policy. The middle echelon, the graduates engaged in research, do the routine work involving specialized knowledge. It should be stated here that a Fisheries Agency should have a strong economic research unit once the initial problems of establishing new fisheries are in hand. Cost of structure, prices and the general effect of fisheries on the economy require constant enquiry, whereas scientific problems such as handling and processing biological questions, etc. arise from day to day and can be examined as they arise. Nobody in this middle echelon should be required to do any internal administrative work. The training of these officers to fit into positions involving policy work will, no doubt, be planned by those in charge of the agency.

The administrative section, while not as demanding of graduates as the research sections, should be made as strong as possible, for reasons already stated. The technical assistance, maintenance, engineering and sea-going sections should be recruited from men experienced in the various practical fields.

(4) The basic aims of the Fisheries Agency are quite clear and simple to ensure better fishing to the fishermen and to manage the fishery in such a way that this better fishing will be permanent. Ancillary aims are to promote measures to avoid waste by use of cold stores, canneries etc., to promote co-operative among the fishing communities, and thus to ensure that the consumer receives the best possible product at the lowest reasonable price. How to achieve these aims is suggested by certain lines of action.

TECHNICAL PAPERS ON FOOD TECHNOLOGY, FISHING CRAFT, FISHING GEAR, SOCIO-ECONOMICS, FISH CULTURE, BIOLOGY, OCEANOGRAPHY AND STATISTICS PRESENTED AT THE 9TH SESSION OF THE INDO-PACIFIC FISHERIES COUNCIL HELD AT KARACHI IN JANUARY, 1961.

Tech. 1.—Processing the Flesh of the Pearl Oyster Pinctada vulgaris schum.

The processing of the pearl oyster for food involves the separation of its adductor muscle and the rapid sun-drying of this fleshy portion. The unused parts of the oyster which include the mantles may be processed separately for pearls. When weather or handling conditions do not permit quick drying, the oyster muscles can be stored in a saturated salt solution till they are ready for drying. The processed material is a palatable food and a good source of protein and can therefore be recommended for inclusion in the local diet.

(C. Gunasekara, Research Chemist, Fisheries Research Station, Colombo, Ceylon).

Tech. 2.—Some Aspects of Prawn Drying in Kerala.

The simple methods of preserving prawns in Kerala are beach-drying and hard-drying (manufacture of prawn pulp). Semi-drying is a recent method introduced by the State Fisheries Department. The comparative merits of each method and the experiments in progress at Fisheries Technological Station, Kozhikode, to improve these methods are enumerated. The work on the objective evaluation of the quality of dried prawns as well as the quality retention measures are suggested.

(S. N. Rao and A. G. Vasavan, Fisheries Technological Station, Calicut, India).

Tech. 3.—A Review of the Salt Fish Industry of Kerala.

Salt curing which is the major method of preserving fish in Kerala is described stage by stage. The industry is still in primitive condition and requires development and improvement. Quickness and hygiene in handling, use of better quality salt in correct proportions, sufficient salting time and proper drying are some of the important steps for the improvement of salt fish industry. The experiments conducted and proposed at Fisheries Technological Station, Kozhikode, on these lines are described. The necessity for further improvement in the methods of packaging, storage and marketing of salt fish is also emphasised.

(S. N. Rao and A. G. Vasavan, Fisheries Technological Station, Calicut, India).

Tech. 4.—Experience in Fishing Boat building applicable to the IPFC Region.

The application of naval architecture to small fishing boat construction is a recent innovation. The layout of a boat, general arrangement of the wheel

house and engine, fuel tanks and fish hold, depend on the actual fishing method and suggestions are made regarding trawlers, long liners, purse seiners and gillnetters. Mechanisation of existing fleet has been easy when traditional craft have been large and sturdily built. With small craft such as canoes and rafts, it has been necessary to design new types of craft. Outboard motors seem to be suitable for small craft and have been well accepted in many countries of the Indo-Pacific Region. Selection of engines must be done with care and it is not economical to instal too high-powered engines. A propeller efficiency of at least 50% should be aimed at and the optimum pitch-diameter ratio for small fishing craft is about 0·6. Propeller posts should be sharpened to increase efficiency. Propeller r.p.m. should be low which can be obtained by using a high speed engine with reduction gear. Care should be exercised in the installation of engine.

Mechanisation of handling of fishing gear is as important as motorisation of the craft. For boats of less than 50 ft. in length, the hydraulic or mechnical winches and other fish handling gear which can be powered from the main engine or auxillary engine are comparatively simple and hardly any difficulty should be encountered in establishing local factories in the IPFC Region. On small open boats, ice boxes appear to be an economic method of stowing the catch. With modern improvements, small steel boats have been found to be cheaper than wooden ones in many parts of the world and the same may apply to this Region. There are also new materials of construction such as aluminium and plastics. The advantages of V-bottom and round-bottom, frames, fastening, caulking and painting of wooden boats are discussed. When ordering a boat, the following should be considered: fishing conditions, operational information, economic factors, construction considerations. The importance of drawings is stressed and some hints are given as to boat designs. An account of FAO work in the development of beach landing craft is given.

(Jan-Olof Traung, Chief, Fishing Boat Section, Technology Branch, Fisheries Division, FAO, Rome)

Tech. 5.—A New Method for Refining of Shark Liver Oil on Commercial Scale and Recovery of Vitamin 'A' by Partial Saponification for Production of Standard Quality as well as Higher Vitamin 'A' Potency Oil.

This is a process for refining and production of shark liver oil by partial saponification either with caustic soda or caustic potash. In this process cotton-seed oil was used as an oil solvent for transference of vitamin from crude shark liver oil. Higher vitamin A potency oil was also produced from lower potency crude shark liver oil by following this process.

(S. A. Ali and L. Rahman, Fisheries Technological Laboratory, Comilla, East Pakistan).

Tech. 6.—Fishing Boats of West Pakistan.

The advantages and disadvantages of existing motorised craft of West Pakistan have been discussed. The designs, mode of construction, and mechanization of the traditional craft are described. Recently shrimp trawlers have gained popularity in Pakistan and now there is a tendency to build boats equipped for both gill-netting as well as shrimp trawling. A description of the shrimp trawlers, their designs, construction and layout are discussed. Fibre-glass sheathing is suggested for underwater protection of the hull from the Teredo worm.

(M. A. Burney, Fisheries and Gear Technologist, Central Fisheries Department, Karachi, Pakistan).

Tech. 7.—Recipes From Canned Galongong (Decapterus Sp.) Salmon Style.

Various recipes utilizing canned galongong (Decapterus Sp.) Salmon style, were prepared and tested by a taste panel according to appearance, flavour and texture.

Efforts were made to reduce the cost of accounting of all the recipes without sacrificing the flavour, appearance and texture. Ingredients used were either obtained locally or imported.

Twenty recipes were approved by the taste panel.

(S. V. Bersamin, D. Calvez and F. R. Gonzales, Technological Research Section, Division of Fisheries Research, Bureau of Fisheries, Diliman, Quezon City, Philippines).

Tech. 8.—Preliminary studies on the comparative chemical composition of the different commercial brands of patis in the Philippines.

Various commercial brands of patis (fermented fish sauce) were analysed comparatively, for their moisture, total solids, total nitrogen and sodium chloride contents.

From the standpoint of nutrition, those with higher total nitrogen contents are considered the better grades. The total solids range from 28·56 per cent to 37·81 per cent and sodium chloride from 22·26 per cent to 26·44 per cent. Samples with high total solids have better keeping quality because of low moisture content.

Although almost all the brands fall within the range requirement of total nitrogen, sodium chloride and total solids set by the Philippine Standard Association, yet, as revealed by the analysis, these standards and requirements are met without technological planning and no effort is being made by the manufacturers to produce uniform standards grades of patis.

(S. V. Bersamin and R. S. J. Napugan, Technological Research Section, Division of Fisheries Research, Bureau of Fisheries, Diliman, Quezon City, Philippines).

Tech. 9.—Effectiveness of Sorbistat on the Storage and keeping quality of Dried Fishery Products.

Sorbistat is a brand of sorbic acid which is an effective non-toxic and practical fungicidal agent for foods. It is capable of preventing the growths of yeasts and molds in dried fiishery products. A concentration of 1·0% solution used as a dip for 10 minutes prevented the growth of molds on dried fish in the round for more than five months. *Sardinella* and *Decapterus* species were used in this experiment. The effectiveness was further increased when the treated fish were kept in sealed cellophane bags. On the other hand, split fish which were brined overnight and washed or refreshed in water containing 0·5 per cent sorbistat solution for one hour before they were sun-dried did not develop any mold for about a period of one year.

(S. V. Bersamin, N. Macalincag and A. S. Legaspi, Division of Fisheries Research, Bureau of Fisheries, Diliman, Quezon City, Philippines).

Tech. 10.—Effectiveness of Biostat (Oxytetracycline Hydrochloride) in maintaining the freshness of Hasa-Hasa (Rastrelliger brachysomus, Bleeker).

Preliminary dipping of hasa-hasa (*Rastrelliger brachysomus*, Blecker) in a solution containing 50 parts per million of Biostat for 15 minutes was effective in prolonging the freshness of fish for 16 days. The fish preserved in Biostat ice alone were good for 11 days while those treated with ordinary ice lasted for 7 days. The fish used in this experiment were purchased from a local market centre and the fish were not in a very fresh state. Effectiveness of Biostat in prolonging the freshness of fish could be accurately determined if the experiment could be conducted on fish caught right in the fishing grounds.

(J.I. Sulit, G. Guevara, N. Macalincag and A. Santos, Bureau of Fisheries, Diliman, Quezon City, Philippines.).

Tech. 11.—Some Sea weeds consumed Fresh in the Philippines.

Utilization of seaweeds directly as human food is well known in the Philippines. Among the species commonly used as food are *Acanthopora Caulerpa, Codium, Gracilaria, Hydroclathrus, Laurencia, Prophyra* and *Sargassum*. The seaweeds are used raw or blanched mostly as salad vegetable.

(S. V. Bersamin, S. V. Laron, F. R. Gonzales and R. B. Banania, Technological Research Section, Division of Fisheries Research, Bureau of Fisheries, Diliman, Quezon City, Philippines).

Tech. 12.—Cooperative Purchasing Business of Women's Groups in Fishing Villages of Japan.

Japanese women's Group organisations in fishing villages which was inaugurated in 1953 have developed rapidly and exceeded 145,000 women members in 1957. This rapid development was expedited by savings campaign and by the end of 1957, the savings were 668,000,000 Yen. The Women's groups have opened a large number of Cooperative Stores. The difficulties in the way of further development of these women's groups as well as remedial measures are discussed. Some examples of successful management of Women's groups fishermen's Cooperatives are given.

(S. Matsumura, Japan Fishing Village Culture Society, Japan.)

Tech. 13.—Application of a Net Gauge to Midwater trawling.

The present net gauge essentially consists of a simple, inexpensive echo sounder, a board and a headline transducer, both equipped with Barium titanate vibrators, and a connection cable of a four-strand piano-wire, outer diameter 13 mm., as coated with neoplane rubber, total length 400 m. The headline transducer is fastened with one vibrator on the upper side, and another on the lower side, of a wooden board, 60 x 30 x 2 cm; and connected with the cable to the echo sound recorder on board.

In the field experiments in Tokyo Bay in April, 1960, observation taken with the help of the net gauge proved that a net under towing could be raised

clear off the bottom, in order to adjust the height of the net to the swimming layer of fish, by increasing the total floatation and making the warp length twice longer than normally needed for a depth of the sea, or increasing the towing speed.

(S. Takayama and T. Koyama, Tokai Regional Fisheries Research Laboratory, Tokyo, Japan.)

Tech. 14.—Development of An Agent for Treating Synthetic and Natural Fibre Nets.

Specific gravity of a net of some synthetic fibres, for instance nylon 6 or vinylon, is not high enough to secure a quick or steady operation of the net for catching fish. Merits of the net treating agent under report are to increase (1) sinking force and velocity (2) wear resistance, for both synthetic fibre net as well as natural fibre net, (3) to give better preservation to natural fibre net.

When applied to synthetic fibre nets of various kinds or natural fibre net, the agent has been found capable of improving fishing efficiency and durability of the nets. Particularly in cases of purse seines for tuna, skipjack or mackerel, and tuna long line, the function of gear treated with this agent was proved excellent. Application of the agent is getting popular among trawl and set net fisheries.

(S. Takayama and Y. Shimozaki, Tokai Regional Fisheries Research Laboratory, Tokyo Japan.)

Tech. 15.—Studies on the Mid-Water Trawl Gears and the Mid-Water Telemeters.

Describes studies on mid-water trawling gears and the use of telemeters for adjusting the depth of the gears. A telemeter with operating frequencies 200 K.C. and 50 K.C. appear to be suitable for working the mid-water trawl.

(C. Hamuro, Fishing Boat Laboratory Production Division, Fisheries Agency, Ministry of Agriculture and Forestry, 3 Chome, Tsukishima, Chuo-ku, Tokyo, Japan.)

Tech. 16.—Fresh water Fish Culture Trial Brunei State.

The unsteady supply of salt water fish in the State led to the trial of fresh water fish culture in 1954. Experiments of culture of five species of Carp fry *viz. Aristichthys nobilis, Ctenopharyngodon idellus, Hypophthamichthys molitrix, Cirrihina molitorella and Cyprinus carpio.* High mortality was observed in the concrete tank, possible causes being lack of oxygen and changes in temperature. The growth of the fish in the experimental pond was poor and the slow growth is attributed to a number of factors.

(Hamidon bin Awang Damit, State Agricultural Officer, Brunei.)

Tech. 18.—Fisheries Loan Fund.

The number of Tai fishermen engaged in the fishing industry is approximately 50,000 in which 35,000 are engaged in Sea Fisheries. Most of

the Sea fishermen lack capital to run their craft and borrow money from fish agents at the wholesale fish markets or money lenders at high-interest.

Every year the sea fishermen invest in the fisheries, about 250 million baht. So the Ministry of Agriculture has made available, to the Department of Fisheries Baht 4,500,000 as a Fisheries Loan Fund. Experienced and industrious fishermen who need both credit and technical assistance to improve their business to make it productive of income are eligible for assistance. At present the Fisheries Department fisheries loan fund stands at about Baht 6,400,000, but the fishermen applied for about 40 million baht.

(K. Suwanarat, Chief, Division of Fisheries Administration, Department of Fisheries, Bangkok, Thailand.)

Tech. 19.—An Attempt to use Radio phosphorus (p. ^{32}) for Productivity Determination of the Sea.

Describes the result of experiments carried out by the authors on the use of radio-phosphorus (P^{32}) for a study of the productivity of the Oceans. The studies were made with red Sea weed *Porphyra* and the results indicate that use of radio-phosphorus is promising.

(R. Fukai, A. Soegiarto and S. Ruamragsa, Exchange students from Indonesia and Thailand sponsored by IAEA.)

Tech. 20.—Comparative Studies on measurements of the weight and the volume of Plankton Samples—A Preliminary Account.

The paper describes and compares methods for the quantitative measurement of plankton. It demonstrates the variations obtained when one and the same sample are measured either for weight or volume by the different methods.

Further complications are introduced according to the species composition of the sample. The paper describes test measurements of weight and volume of selected pure samples of plankton species as well as mixed samples.

A major factor inducing variation in results is the adherent moisture the quantity of which appears to vary inversely to the size of the sample.

Other errors occur through damage occurring to the individual plankters during the removal of moisture.

Values obtained by the different methods cannot be regarded as equivalents and hence the necessity for the general adoption of one standard method is emphasised.

(Zinziro Nakai and Koji Honjo, Tokai Regional Fisheries Research Laboratory, Tokyo, Japan.)

Tech. 21.—Fish Liver Oil in Indonesia.

The various methods of fish liver oil extraction in Indonesia are described. These methods include dripping, steaming, and solvent extraction. Results

of analysis on fish liver oil from *Scoliodon jordani* show that the Vitamin 'A' content per gram of the oil varies from 1,401 I.U. by the steaming method to 55,580 I.U. by the solvent extraction method. It is recommended that the liver oil be first separated by dripping, the residue be then extracted with petroleum ether and oil in the final residue recovered by steaming.

(B. Lubis, Technological Research Officer, Sea Fisheries Service, Djakarta, Indonesia.).

Tech. 22.—A preliminary Report on Experiments of Fish Drying with an Artificial Dryer.

An artificial dryer has been designed for drying of salted fisheries products. The dryer consist of a small chamber 2½ meters long, 2½ meters wide, and 3 meters high. A wooden frame 2½ into 2¼ and 3 meters covered the woven bamboo forms the small chamber. The chamber is made air-tight by lime washing. The dryer is heated by burning wood in a stove and the hot gases of combustion are passed into a U-shaped heating coil which is situated inside the chamber. The experiments have indicated that the various species of fish are dried within the period 9-15 hours and the quantity of the material used may be up to 100 kg.

(S. Darmoredjo, Technical Research Officer, Sea Fisheries Service, Djakarta, Indonesia.).

Tech. 23.—An Observation on the Development of Tuna Like Fishes Trolling by Motorized Vessels.

The paper gives an account of the catch of tuna and the tuna-like fishes caught by the Indonesian trolling fisheries in the Indian Ocean and in the Java Sea. The trolling fisheries is carried out by wooden vessels of 30 tons which are powered with 25-60 H.P. diesel engines. The average caught per vessel in a single voyage is 200-300 kg. The monthly fishing landings of the south east coast of Bali and in Karimundjawa Island are shown in Tables.

(M. Unar, Fisheries Research Officer, Sea Fisheries Service, Djarkarta, Indonesia.).

Tech. 24.—Economic Marine Algae of Ceylon.

Brown Sea weeds belonging to the genus Sargassum and red Sea weeds belonging to the Genera *Gracilaria, Gelidium* and *Hypnea* occur extensively in Ceylonese waters. A method of producing good quality agar from *Gracilaria* species has been described. The fresh Seaweed is allowed to dry by spreading on mat and fresh water is sprinkled on the Seaweed so that they are completely bleached. The dry seaweeds are then boiled for 3 hours or more in 0·1% lime water using 3% of Seaweeds. The extract is treated with activated charcoal filtered and frozen in trays. The Agar layer is separated and dried. Some of the uses of agar are mentioned.

(M. Durairatnam, Research Officer, Fisheries Research Station, Colombo, Ceylon.).

Tech. 25.—Notes on the Life and Habits of the Adults and Larval Stages of Macrobrachium Carcinus (Fab.).

Since the Summer of 1959, simple experiments on the culturing, hatching and rearing of the larval stages of the giant long-legged prawn, *Macrobrachium carcinus* (*Feb.*) are being conducted.

The adults can be kept in aquarium tanks without much difficulty. They are omnivorous in food habit, feeding greedily on both plant and animal material. Moulting takes place rather irregularly, once in about 20-40 days, depending mostly on the amount and quality of food taken. Mating can be induced to take place in aquarium when the females are fully ripe sexually. Pre-mating moulting, characteristics of ripe females and mating process have been studied and recorded.

Eggs are laid in about 24 hours after the pre-mating or spawning moulting, and are held in the brood pouch among the swimmerettes. The incubation period of the eggs is about 20 days under room temperature (about 28°C during the day and 25°C at night).

When kept in fresh water all larvae died within 4 days and most of them failed to pass through the first moulting. When kept in mixture of fresh and seawater (10% to 30% seawater) larvae survived well and moulting took place once in about 2 days during the first 10 days and became less frequent afterwards. The eyes of the first stage larvae are held close to the head while those of the 2nd and onward stages are extended laterally and are clearly stalked. Uropods appeared after the 2nd moulting. Swimmerettes appeared when the larvae are about 25 days old.

Larvae are greedy feeders but when overfed are liable to sink to the bottom and die. Newly hatched larvae survived well on protozoan and other minute zooplankton. After first moulting they feed well on minute crustaceans. When hungry the stronger ones would feed on the weaker ones or the newly moulted ones.

So far, the longest period that the larvae survived under laboratory condition is 55 days.

(S. W. Ling Fisheries Biologist, F.A.O. of U.N. and A.B.O. Merican, Inland Fisheries Research Officer, Department of Fisheries Federation of Malaya.).

Tech. 26.—A study of Drift in the North Malacca Strait from Salinity Determinations.

A study of the daily changes in salinity at three points in the north Malacca Strait *viz.* Muka Head, Pulau Rimau and Pulau Angsa have been carried out for twenty-five months.

A strong correlation is noted between salinity variations and seasonal rainfall due to the north-east and south-east monsoons.

The drift of currents in the north Malacca strait is in the north-west direction throughout the year and plays a minor role in the salinity variations in the northern area than in the southern part of the Malacca Strait.

(V. Selvarajah, Fisheries Officer (Technical) Fisheries Department, Federation of Malaya.).

Tech. 27.—A preliminary study in the preservation of salt fish in cold Rooms.

The demand for cured fish and cured fish products during the off-seasons of the fishing industry as well as the rapid decomposition of large quantities of unsold cured fish in curing establishments create problems of storage among fish curers as well as traders all over Malaya. This problem is particularly felt along the east coast where a substantial portion of the wet fish landings find their way to the consumer in the salted form. Consequently a strong need arises for suitable methods of storage of salted and other cured fish products especially during the heavy north-east monsoon period when fishing activities are curtailed for at least three to four months of the year. During this period the east coast population depends primarily on cured fish products to supplement the largely carbohydrate diet of rice.

Chinese salt fish dealers in the larger towns in Malaya have been using refrigerated cold rooms for salt fish preservation with satisfactory results, but technical information on the optimum temperature and humidity ranges for preservation, however, have not been recorded. They have now been studied and the findings are here recorded.

(V. Selvarajah, Fisheries Officer (Technical) Fisheries Department, Penang, Federation of Malaya.).

Tech. 28.—A preliminary report on the Rastrelliger Fishery in Malaya.

The Rastrelliger Fishery at Pangkor Island, Perak, is described. A brief comparison of the trends in development of gear and boats is made for the years 1948 and 1959. Annual landings for the years 1949 to 1960 (to September) together with data on number of boats operating and catch/boat are compared. A similar comparison is made for the years 1958, 1959, 1960 (to September) for each month of the year, but with some additional information. The method of disposal of catches whether iced, boiled or salted, and the quantities for the three years are summarised. Seasonal trends, and the size composition of catches are briefly discussed.

Some results of biological investigations on spawning, size at first maturity, fecundity and on the feeding habits are included.

(D. Pathansali, Fisheries Officer (Research) Fisheries Department, Penang, Federation of Malaya).

Tech. 29.—Fisheries Statistics of Thailand.

Present arrangement for statistical collection include data on licensed fishing vessels of over 6 metric tons, Fish pond on public land leased of under permits issued by the Department of Fisheries, Fishpond production, Fish products, the catch and its utilisation the number of fishing gear showing different types and other fisheries data, such as the volume of fish entering Bangkok wholesale Fish market and market prices. The statistical program is the responsibility of the Office of the Secretary, Department of Fisheries.

The proposed plan of action to obviate the defects in the present statistical system will include a census of the factors of production in the fishery industries

already in existence and provision of statistical forms for entering of the empirical data to all agencies in fishing industry whose operations are completely under the administrative control of the Department of Fisheries.

Sampling Units and the choice of sampling design under sampling for estimating the catch of sea fish, economic statistics and Biological statistics are discussed.

(S. Suwananonta, Fisheries Department, Bangkok, Thailand.).

Tech. 30.—Plankton studies in Manila Bay. Standardization of Plankton Nets and plankton volumes.

This paper is a contribution to the series of technical papers on the plankton studies of Manila Bay in connection with the life history of commercially important fishes in the area.

After the introduction and discussion of the methods, an attempt was made to show the relationship between the Settling and Displacement method of determining the total net-plankton volumes by using the Hensen egg net for four months, in all stations. The ratio of Settling to Displacement (S/D) or conversion factor of 4·7423 was arrived at by using three methods.

A comparison of the density of catches of the Hensen egg net and the Marutoku-type B nets in stations B and D from November, 1958 to January, 1960 by using the displacement method of volume determination showed that there was no significant difference in using the Hensen egg net as compared to the Marutoku-B net and in as much as the latter is much smaller and because of the ease of handling, consideration on the advisability of concentrating on the use of the Marutoku-B net is sought.

(I. A. Ronquillo and E. Bernabe, Bureau of Fisheries, Diliman, Quezon City, Philippines.).

Tech. 31.—Status and Progress of Chanos Fishery in the Philippines.

Present status and the extent of development of chanos fishery in the Philippines are described. Particular emphasis is given to the chanos pond culture industry. New advances noted within very recent period are summarized.

(Herminio R. Rabanal, Bureau of Fisheries, Diliman, Quezon City, Philippines.).

Tech. 32.—Present status of Research and Development in connection with the chanos Fisheries in Vietnam.

Chanos chanos is a well known fish in Vietnam. But upto recently the chanos culture was primitively practiced in the Central Vietnam from 1958; investigations along the central coast revealed an occurrence of milk fish fry (from March to October). In 1959 and 1960 the collecting of fish fry was conducted successfully. From 5 to 10 million of chanos fry will be expected to be collected annually in the future.

The fish fry were stocked in governmental nursery ponds upto the fingerlings size, then they are distributed to the fish farmer to be stocked in ponds.

Actually, most of the areas formerly occupied by mangrove, uncultivated land or unused salt-field are transformed into milk fish ponds.

(Le Van Dang, Inspector of Fisheries, Chief of Fish culture service, Direction of Fisheries, Saigon, Vietnam.).

Tech. 33.—A Preliminary Brief Report on Artificial Mullet (Mugil sp.) culture in Korea.

A brief ecological factors of Mullet (Mugil sp.) spawning ground, and catch data and measurements of the fish were surveyed.

In artificial hatching, the optimal salinity range of the media for the hatching found between 15 0/00 to 25 0/00. A greater number of eggs and no change of medial during the developments in the container resulted better hatching rate than the less number of samples in the same amount of water.

Explanations and illustrations of the embryological and yolksae larvae developments were given.

(Aquiculture and Propagation Section, Central Fisheries Experiment Station, Office of Marine Affairs, Republic of Korea.).

Tech. 34.—Tagging of Rastrelliger in Thailand.

A progress report covering the work done in the Second step of a preliminary tagging experiment on Rastrelliger in Thailand.

(S. Bandhukul, Fisheries Department, Bangkok, Thailand.).

Tech. 35.—The Tropical Fish Culture Research Institute, Malacca, Federation of Malaya.

The Tropical Fish Culture Research Institute at Malacca, besides being the largest station of its kind in S. E. Asia, is one of the largest in the world and provides special facilities for research. It is intended to serve all tropical commonwealth territories, but particularly the problems of fish culture in the Federation of Malaya.

The pond area consists of some 170 acres and there are 164 ponds of various size allowing a variety of statistical experiments. The main aim of the Institute is to discover how good crop of first quality fish may be raised, quickly, cheaply and with the minimum expenditure and equally important the scientific reasons for successes or failures. Stocks of 12 species of fish are maintained at the Institute and Grass carp and various strains of *Tilapia mossambica* are subjected to intensive research.

(G. A. Prowse, Director, Tropical Fish Culture Research Institute, Malacca, Federation of Malaya.).

Tech. 36.—The Economics of fish culture.

The present paper is concerned with the methods of Chinese Carp culture in S. E. Asia and the economic efficiency of the system. Basically the methods involved the culture of three species of carp, the predominantly grass eating *Ctenopharyngodon idellus* cuv. et val, with two plankton feeders the big head *Aristichthys nobilis* Richardson which tends to feed on coarse plankton, and the silver carp, *Hypophthalmichthys molithrix*. cuv et val. feeding on the finer plankton.

Recent research at Malacca demonstrated the superiority of superphosphate over animal manure as a fertilizer. Evidence in favour of using animal manure on land crops, and substituting phosphates in the ponds, with special emphasis on hygienic reasons for advocating change in the methods are discussed. Phosphate still appears to be the most generally valuable fertilizer in most areas, although in some cases other ions may be necessary as well. Reports from most countries suggest that the use of animal manure stimulate dense growth of *Eugleninea* and often *Microcystis*. Thus the contention that the use of cheap efficient, artificial fertilisers is superior to that of animal manures appears to be valid the world over.

(G.A. Prowse, Director, Tropical Fish Culture Research Institute, Malacca, Federation of Malaya.).

Tech. 37.—Remarks in Pisciculture and Fisheries in Mozambique.

Work done in the various districts of Mozambique in the field of Inland water Fisheries for improving the diet of the population, Fish breeding Stations, fishing and fish import, are dealt with.

(H. daCosta, Chief of Pisciculture Section, Inland Fisheries, Mozamzique, Africa.).

Tech. 38.—Recent Advances in Piscicultural Practices in Pakistan.

A method has been devised to overcome the difficulty of nursery ponds drying up when fry are available from the natural spawning grounds. A shallow part of a big water area is separated from the main water by a bamboo or wire gauge screen and fry introduced into the improvised nursery when fry can be obtained. This method has produced very good results.

In West Pakistan as a test case to get an idea as to how many fry are likely to be available in different parts of the province about 30,000 to 40,000 1/2″ to 2″ long fry were collected and carried in one trip with very negligible mortality in place of from 500 to 1000 young fish of 5″ and above transported at prohibitive cost. The result obtained are very encouraging and it appears that millions of fry can be collected from different parts of the province as against a few thousand young fish in the past. Natural spawning grounds are proposed to be utilized as improvised nurseries. From next year it has been proposed to collect fry and transport them to nurseries to be set up in every district and thus more young fish will be available than in the past for stocking, derelict water areas, cost of transport will be negligible and fry will be raised to proper size in the nurseries for stocking the ponds in the neighbourhood.

(Nazir Ahmed, Director of Fisheries, West Pakistan.).

GMGIPND—DME—N3—49 F & Agri. (JC 1803)—4-9-61—500.

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G.I. PRESS, NEW DELHI.